AMENDMENTS TO THE SPECIFICATION

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RESISTANCE ELEMENT FOR POTENTIOMETRIC DEVICES, AND METHOD OF MANUFACTURE

Background of the Invention

Field of Invention

This invention pertains generally to variable resistors and, more particularly, to a conductive plastic resistance element for use in potentiometric devices, and to a method of manufacturing the same.

Related Art

In potentiometers and other types of variable resistors, the rubbing action between the so-called wiper contacts and the resistive elements can change the topography or surface contour of the resistive elements over the lifetime of the devices. Such changes produce variations in resistance between the contacts and the resistive elements, and those variations can result in disturbances and erroneous readings in sensors and other instruments in which the potentiometers are utilized.

With conductive plastic resistance elements, there is relatively little wear on the elements, but there is a slight smoothing or polishing in the areas which are contacted by the wipers. This removes surface protrusions and decreases effective contact pressure, resulting in increased electrical resistance or noise between the resistance element and the wiper contact. In addition, a thin film of insulating material may form on the surface of the element due to the presence of lubricants and plastic material in the element.

Heretofore, the most widely used technique for reducing contact resistance variations with conductive plastic resistance elements has been to increase the contact pressure and to use a silicone lubricant between the wiper and the resistance element.

With other types of resistive elements, variations in contact resistance have been reduced by embedding particles of conductive material in the surface of the resistive element which is engaged by the wiper contact. U.S. Patents 4,278,725 and 4,824,694, for example, show the use of conductive particles in cermet resistive elements, *i.e.*

elements containing a mixture of ceramic and metallic materials. Such techniques have not, however, heretofore been employed in conductive plastic resistance elements.

Objects and Summary

It is in general an object of the invention to provide a new and improved resistance element for use in potentiometric devices, and to a method of manufacturing the same.

Another object of the invention is to provide a resistance element and method of the above character which overcome the limitations and disadvantages of conductive plastic resistance elements of the prior art.

These and other objects are achieved in accordance with the invention by providing a conductive plastic resistance element having particles of conductive material embedded therein and projecting therefrom for contact by the wiper of a potentiometric device in which the resistance element is employed. The resistance element is made by processing carbon powder, resin, solvent and conductive phases to form a paste, applying the paste to a substrate, and curing the paste to drive off the solvent and form a film, with the conductive phases rising to the surface of the film and becoming embedded therein.

Detailed Description

A conductive plastic resistance element is made by combining carbon powder with a resin and solvent mixture, along with other fillers, wetting agents, and other components. These materials are mixed in a high shear mixer to form a viscous paste which is then screen printed onto a substrate and cured at temperatures on the order of 200°C. The curing operation drives off the solvents and crosslinks the plastic matrix to form a hard, abrasion resistant film. Carbon is the current carrying phase, and a higher percentage of carbon produces a cured film of lower resistance.